COURSE SYLLABUS

LAST REVIEW	Fall 2022
COURSE TITLE	Heating and Air Conditioning
COURSE NUMBER	AUTT-0272
DIVISION	Career and Technical Education
DEPARTMENT	AUTT
CIP CODE	47.0604
CREDIT HOURS	3
CONTACT HOURS/WEEK	Class: 1 Lab: 4
PREREQUISITES	AUTT-0103
COREQUISITES	None
COURSE PLACEMENT	None

COURSE DESCRIPTION
In this course students will study and perform tasks from the National Automotive Technicians Education Foundation's (NATEF) Automotive Service Technology (AST) program. Students will study and perform service on heating and air conditioning systems using modern equipment and service procedures. All students will successfully complete each element of personal safety training before working in the Automotive Laboratory.

PROGRAM ALIGNMENT
This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:
https://kansasregents.org/workforce_development/program-alignment

PROGRAM LEARNING OUTCOMES
1 Demonstrate adherence to safety and pollution prevention standards according to OSHA and EPA regulations.
2. Demonstrate the ability to communicate effectively in workplace scenarios with an appropriate level of preparedness for daily tasks and assignments.
3. Demonstrate the ability to diagnose and repair mechanical and electrical damage according to Original Equipment Manufacturer (OEM) specifications and recommendations.

TEXTBOOKS
http://kckccbookstore.com/

METHODS OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE

I. Principles of Refrigeration
   A. States of matter
   B. Heat and matter
   C. Methods of heat transfer
   D. Heat movement
   E. Heat measurement
   F. Vaporization and evaporation
   G. Condensation
   H. Pressure and temperature
II. Basic Refrigeration Cycle
   A. Cycling Clutch Orifice Tube (CCOT)
   B. Expansion valve system
   C. Refrigerant types
III. Automotive Air Conditioning System
   A. High and low sides
   B. Air conditioning compressor
   C. Compressor types
   D. Refrigerant oil
   E. Refrigerant hoses
   F. Air conditioning condenser
   G. Receiver-drier
   H. Accumulator
   I. Muffler
   J. Evaporator
IV. Air Conditioning System Controls
   A. Actuators
   B. Cycling/low pressure switches/sensors
   C. High pressure switches/sensors
   D. Other A/C system controls
   E. Computer controls
   F. Sensors
   G. Actuators
V. Heating System
      A. Flushing
   B. Thermostat
   C. Stoppage

D. Coolant types
E. Bleeding air
F. Water control valve
G. Quick disconnect tools

VI. Plenum and Ducting
A. Vacuum/electric actuators
B. Blend air doors
C. Recirculating air doors
D. Mode doors

VII. Passenger Compartment Filters

VIII. Solar Ventilation

IX. Inspecting an Air Conditioning System
A. Scanning the A/C system
B. Checking line temperatures
C. Inspecting the sight glass

X. Refrigerant Safety Precautions

XI. Testing an Air Conditioning System
A. Pressure gauge (manifold) assembly
B. Charging stations
C. Service valves
C. Connecting A/C pressure gauges
D. Static A/C pressure reading
E. Performance testing A/C system
F. Locating A/C system leaks

XII. Service Procedures
A. Recovering refrigerant
B. Evacuating an air conditioning system
C. Flushing A/C systems
D. Adding refrigerant oil
E. Charging an air conditioning system
F. Recovery tank
G. Scanning HVAC modules

XIII. Common A/C Component Problems
A. Evaporator problems
B. Compressor problems
C. Condenser problems
D. Receiver-drier/accumulator problems
E. Expansion valve or orifice tube problems
F. Refrigerant line problems

XIV. Refrigerant
A. R-12
B. R-134A
C. 1234YF
D. Refrigerant oils

XV. Servicing Electric Compressors
XVI.EPA 609 Certification
   A. Study guides
   B. Take tests

COURSE LEARNING OUTCOMES AND COMPETENCIES
Upon successful completion of this course, the student will:

A. Describe general A/C system diagnosis and repair.
   1. Identify and interpret heating and air conditioning problems; determine necessary action.
   2. Performance test A/C system; identify problems.
   3. Identify abnormal operating noises in the A/C system; determine necessary action.
   4. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.
   5. Leak test A/C system; determine necessary action.
   6. Inspect condition of refrigerant oil removed from A/C system; determine necessary action.
   7. Determine recommended oil and oil capacity for system application.
   8. Use a scan tool to observe and record related HVAC data and trouble codes.

B. Describe refrigeration system component diagnosis and repair.
   9. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.
   10. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity.
   11. Determine need for an additional A/C system filter; perform necessary action.
   12. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.
   13. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity.
   14. Remove, inspect, and install expansion valve or orifice (expansion) tube.
   15. Inspect evaporator housing water drain; perform necessary action.
   16. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.

C. Describe heating, ventilation, and engine cooling system diagnosis and repair.
   17. Inspect and test heater control valve(s); perform necessary action.

D. Describe operating systems and related controls diagnosis and repair.
   18. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.
   19. Diagnose A/C compressor clutch control systems; determine necessary action.
   20. Diagnose malfunctions in the vacuum, mechanical, and electrical components

and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.
21. Inspect and test A/C-heater control panel assembly; determine necessary action.
22. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.
23. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.

E. Describe refrigerant recovery, recycling, and handling.
24. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
25. Identify and recover A/C system refrigerant.
26. Recycle, label, and store refrigerant.
27. Evacuate and charge A/C system; add refrigerant oil as required.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES
Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES
Student Handbook
https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf

College Catalog
https://www.kckcc.edu/academics/catalog/index.html

College Policies and Statements
https://www.kckcc.edu/about/policies-statements/index.html

Accessibility and Accommodations
https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html.